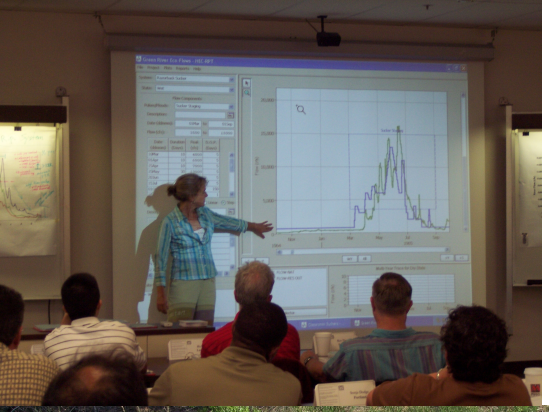
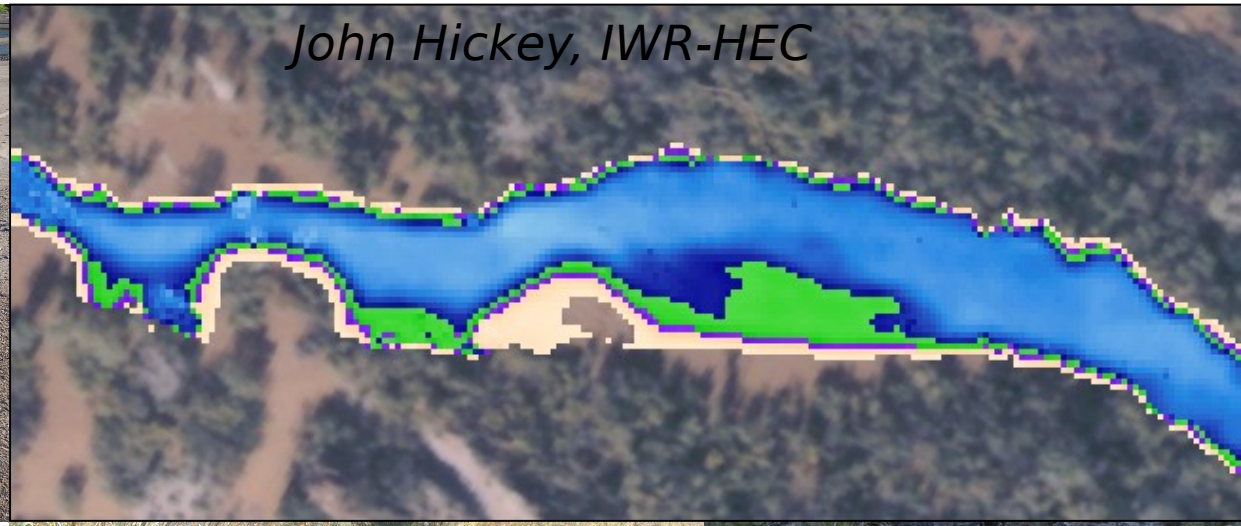


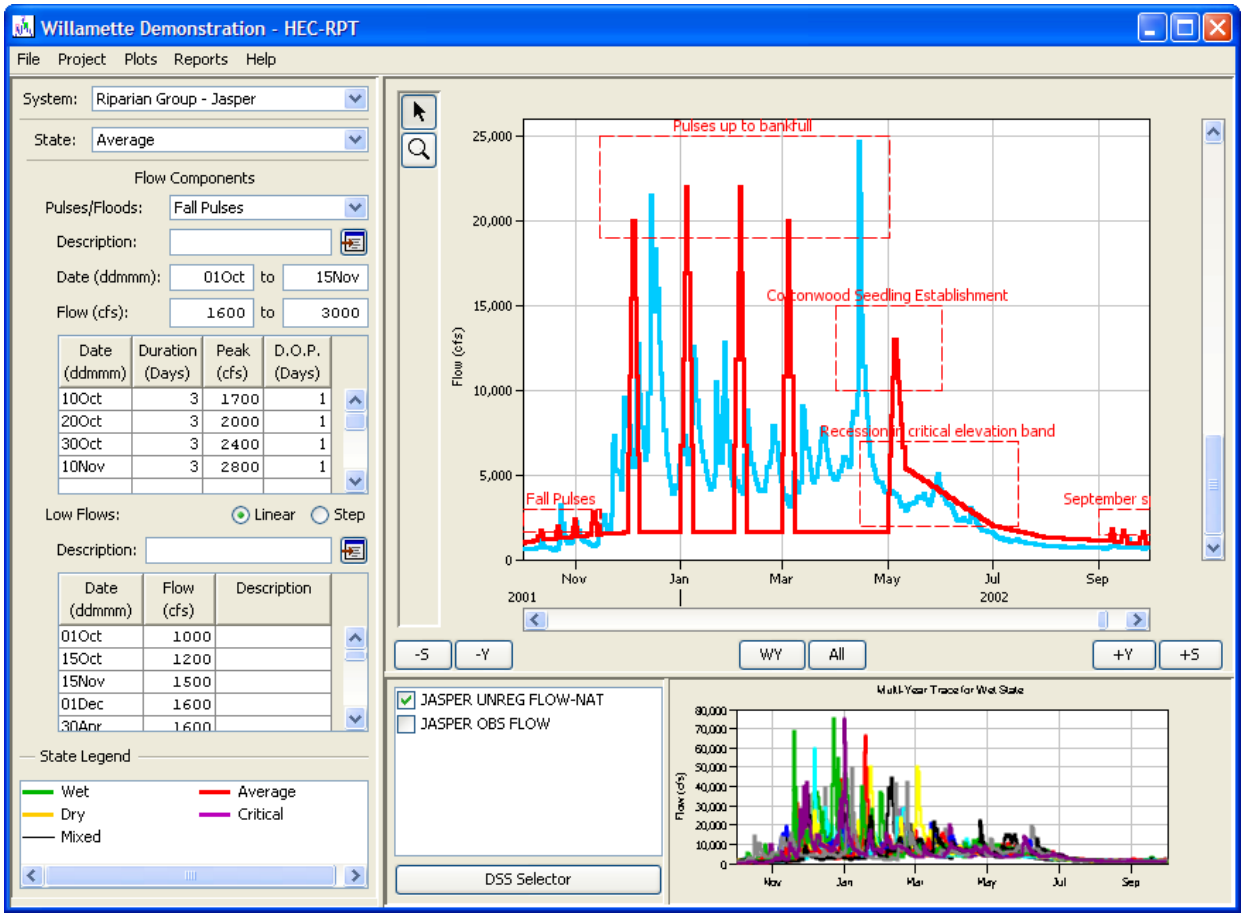
New HEC Tools for Ecosystem Restoration and Management

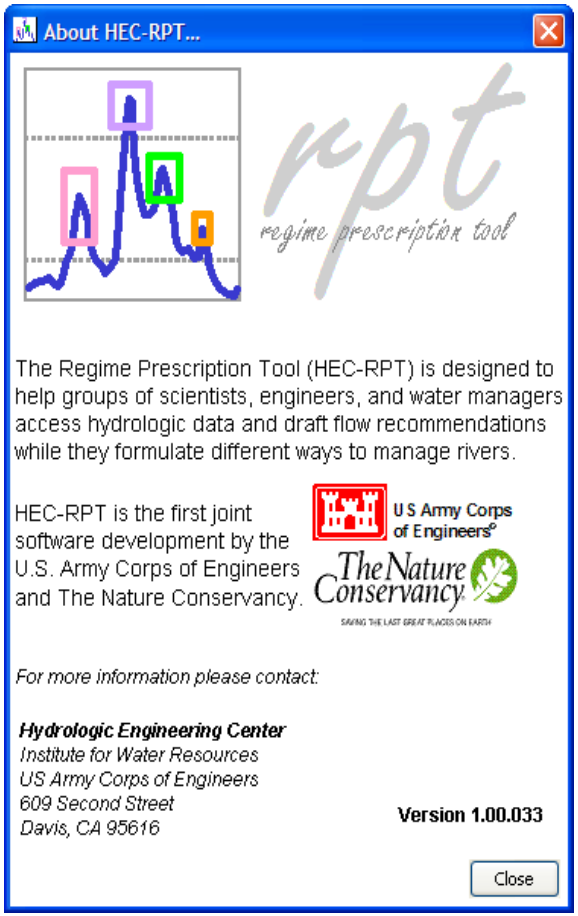
John Hickey, IWR-HEC



HEC-RPT (Regime Prescription Tool)

Help different interest groups reach consensus about how rivers should be managed



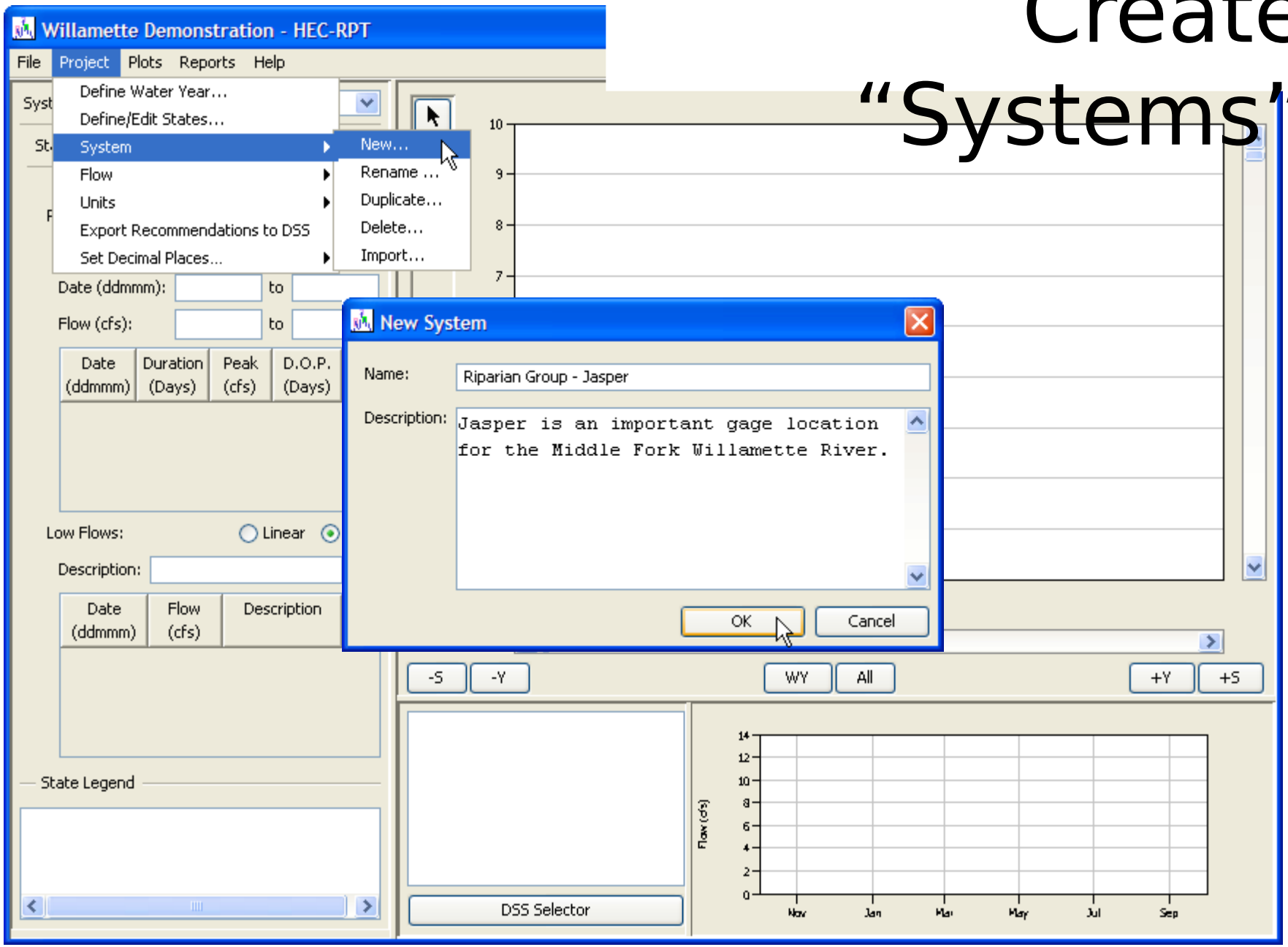

About HEC-RPT...
rpt
regime prescription tool
The Regime Prescription Tool (HEC-RPT) is designed to help groups of scientists, engineers, and water managers access hydrologic data and draft flow recommendations while they formulate different ways to manage rivers.
HEC-RPT is the first joint software development by the U.S. Army Corps of Engineers and The Nature Conservancy.
US Army Corps of Engineers
The Nature Conservancy
For more information please contact:
Hydrologic Engineering Center
Institute for Water Resources
US Army Corps of Engineers
609 Second Street
Davis, CA 95616
Version 1.00.033
Close

Phase 1 – Setting up the project

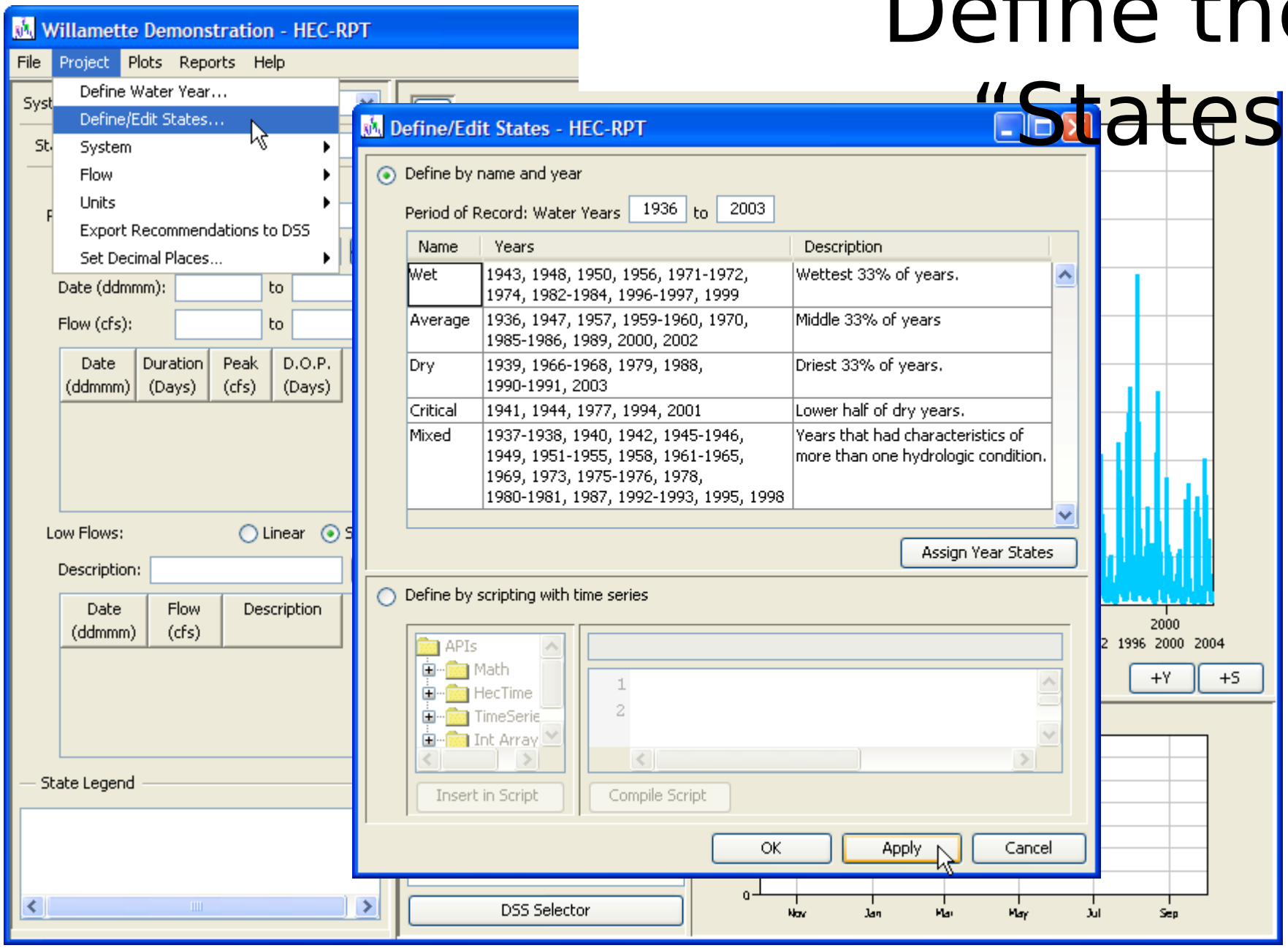
Phase 2 – Use RPT to help build stakeholder flows

Phase 3 – Use RPT to help unify flows from different stakeholders

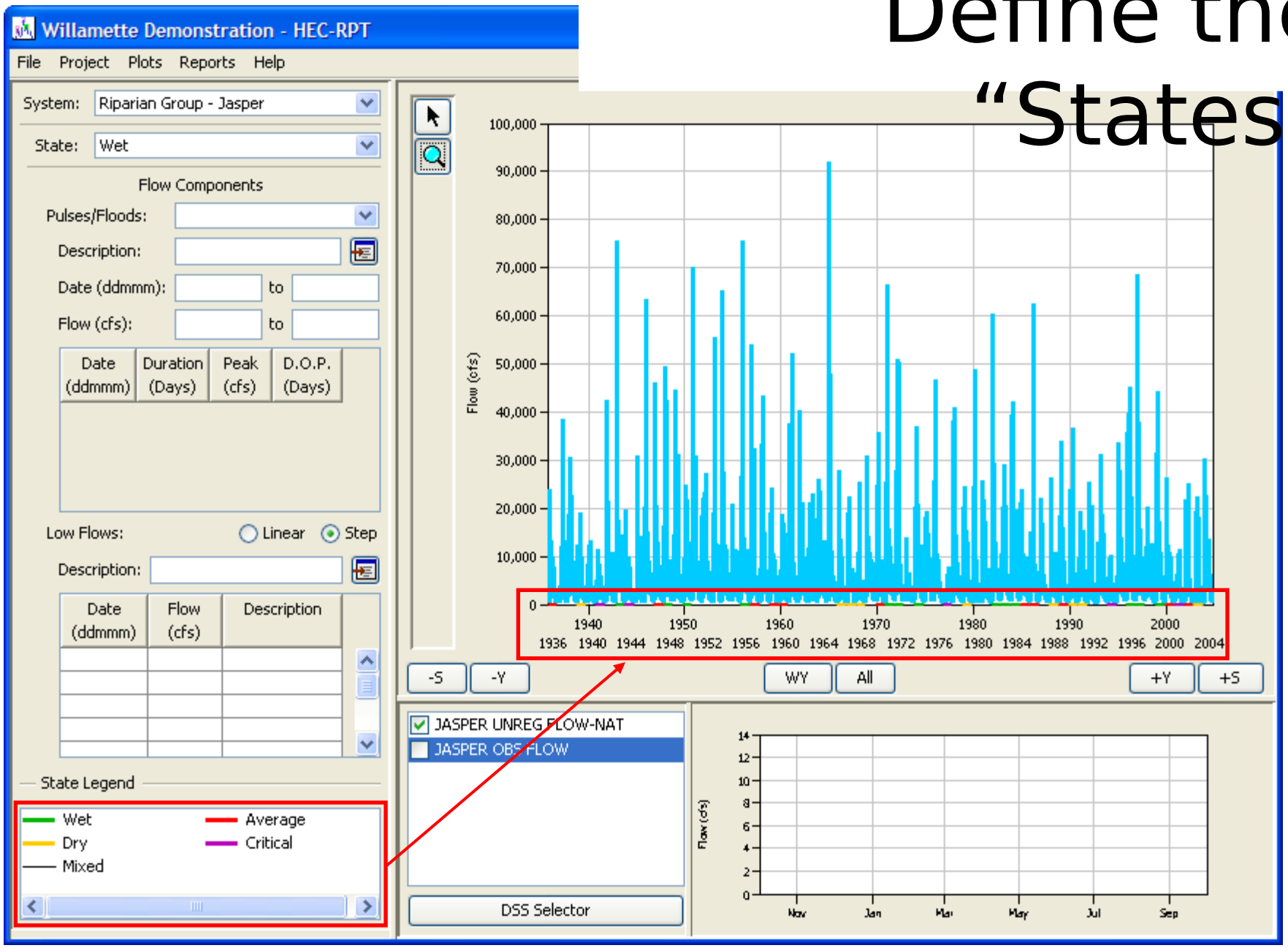
Create “Systems”



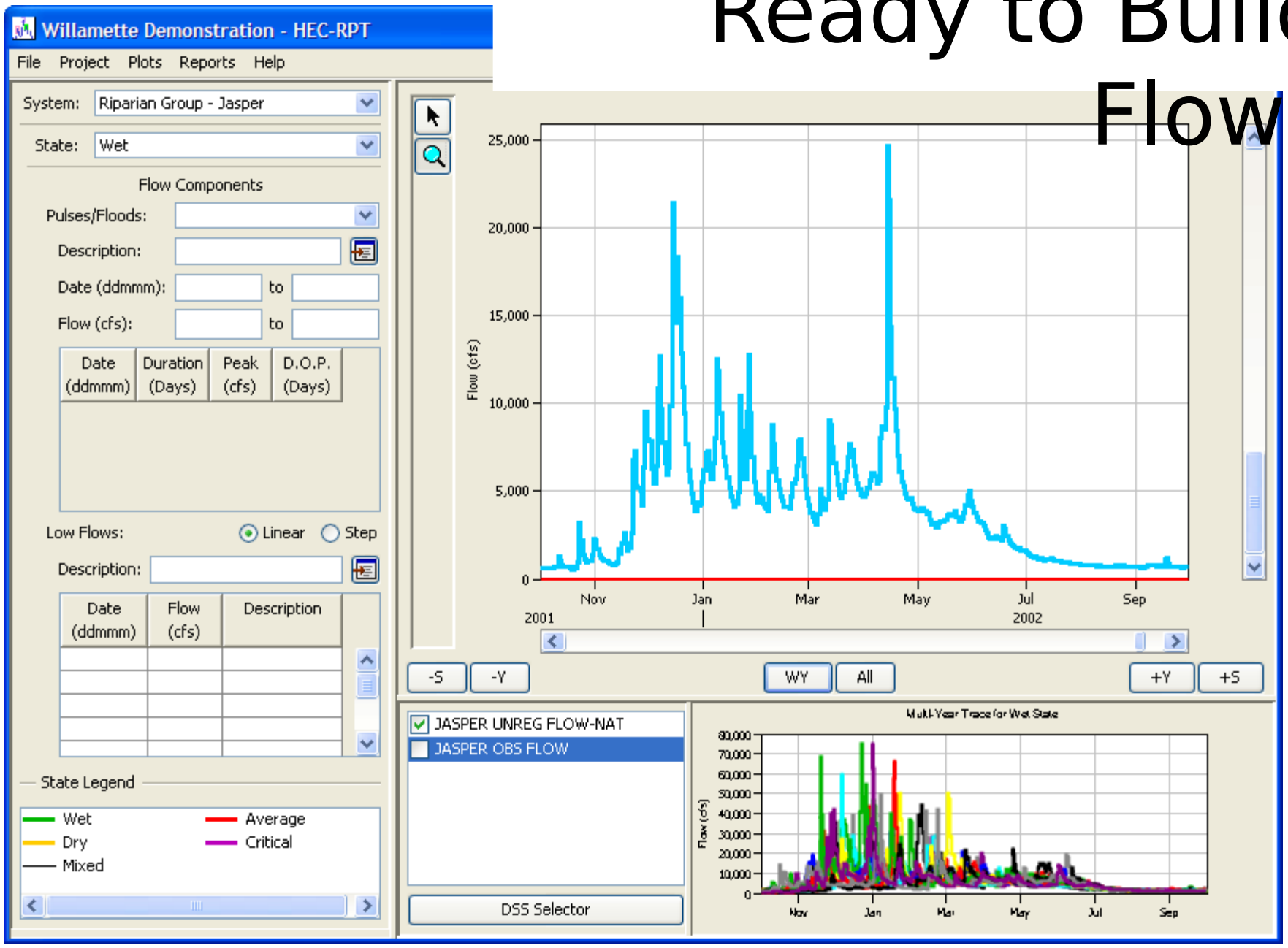
Define the “States”



Define the "States"



Ready to Build Flows

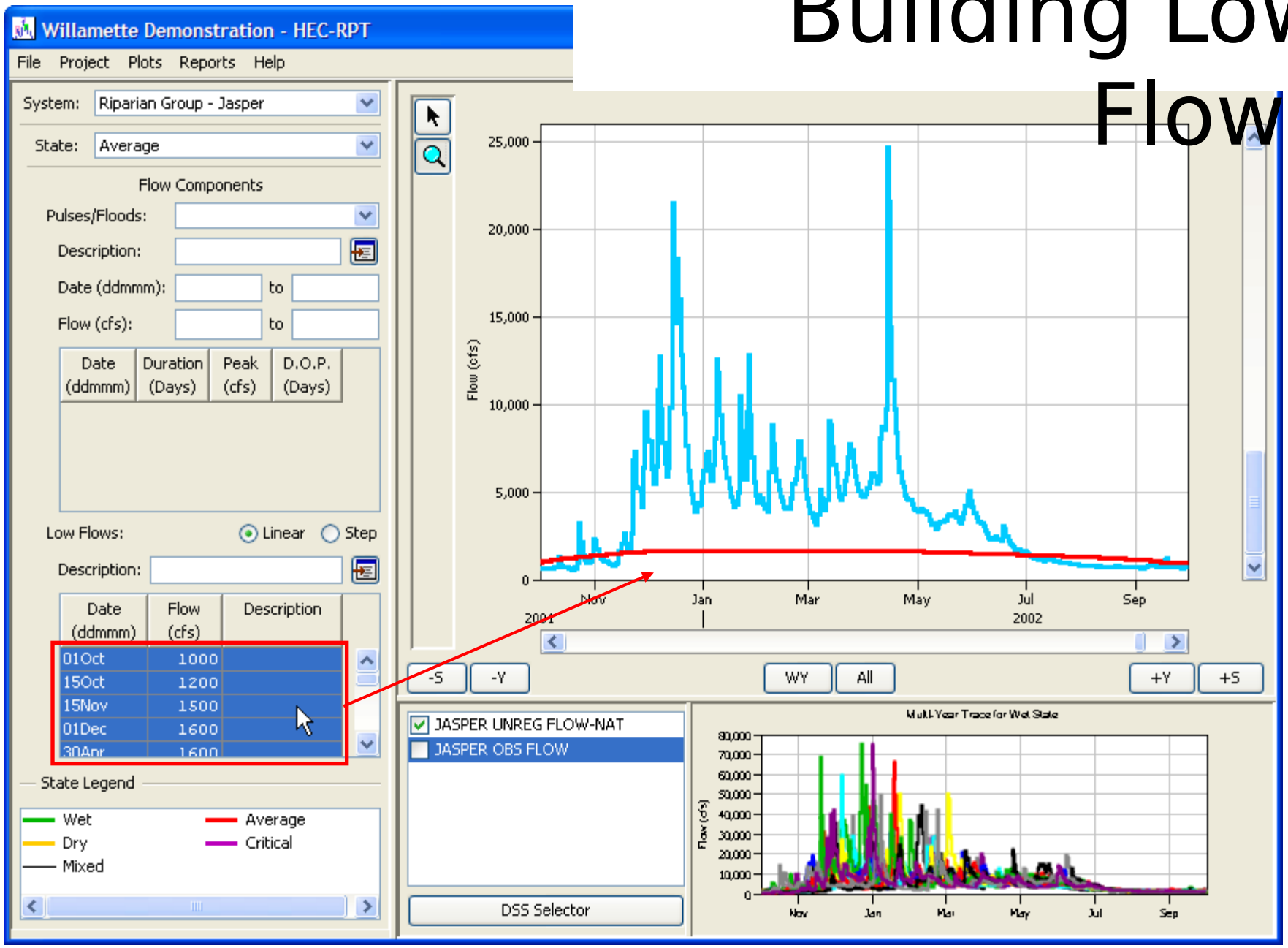


Phase 1 – Setting up the project

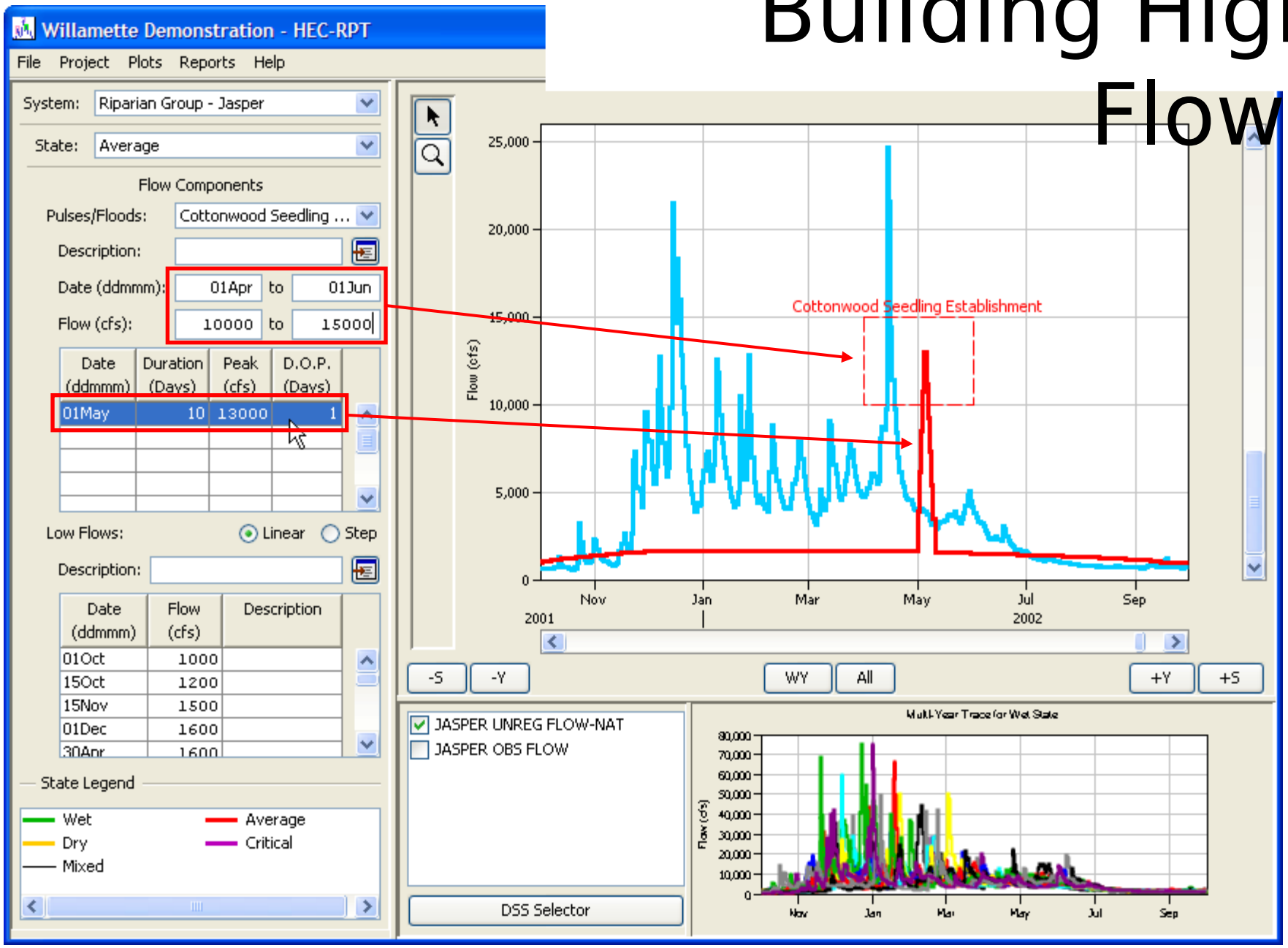
Phase 2 – Use RPT to help build stakeholder flows

Phase 3 – Use RPT to help unify flows from different stakeholders

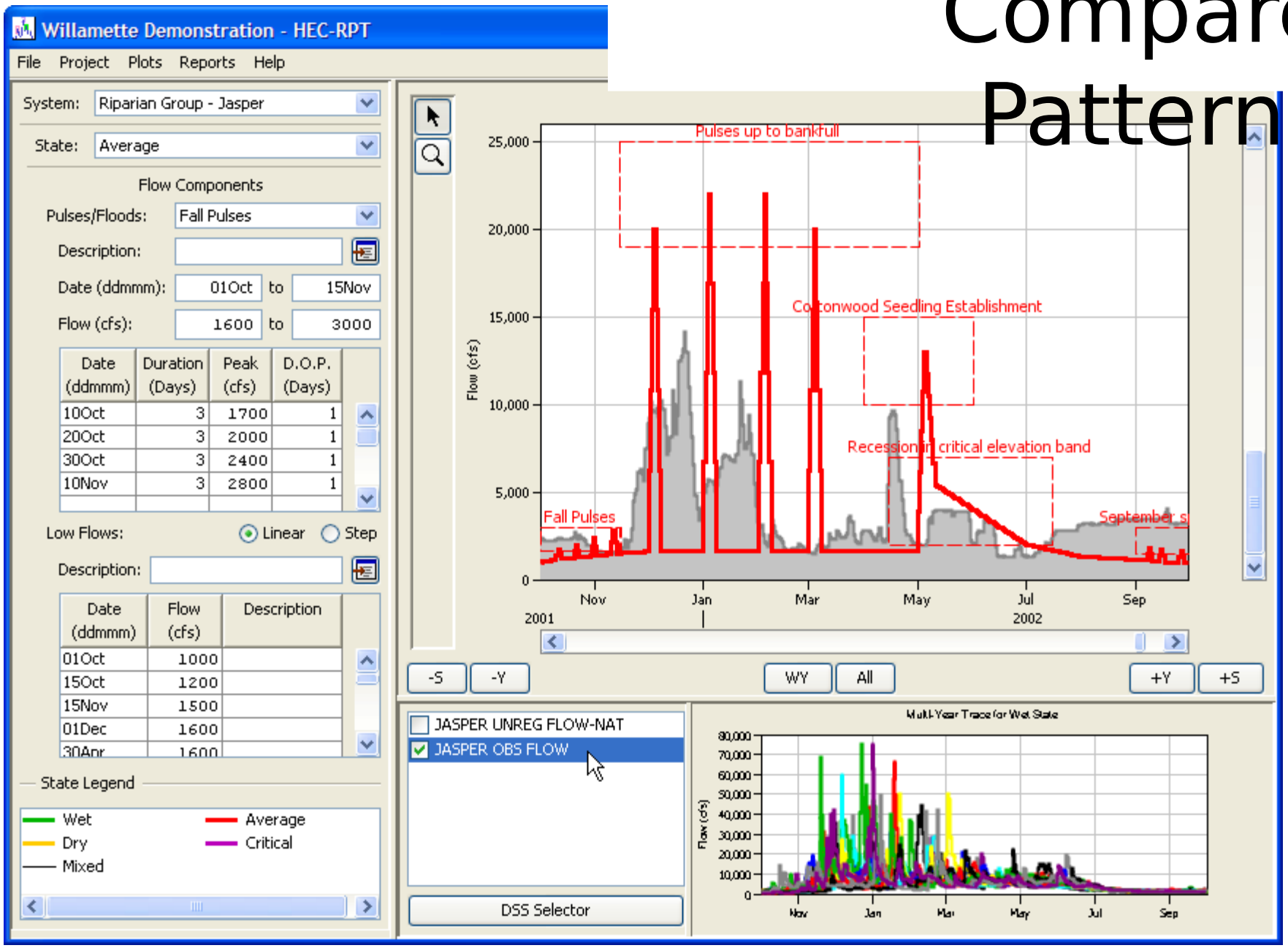
Building Low Flows



Building High Flows



Compare Patterns



Phase 1 – Setting up the project

Phase 2 – Use RPT to help build stakeholder flows

Phase 3 – Use RPT to help unify flows from different stakeholders

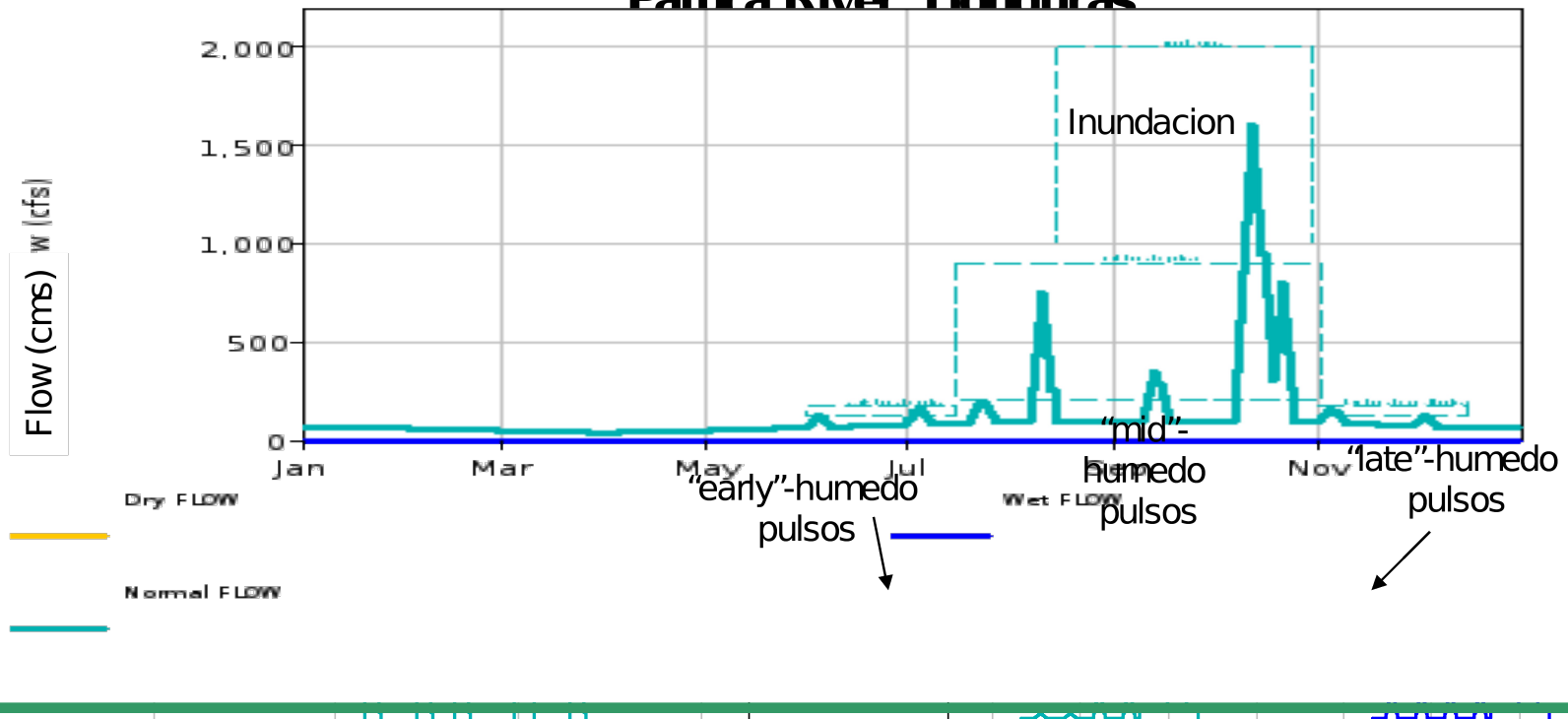
Channel morphology group

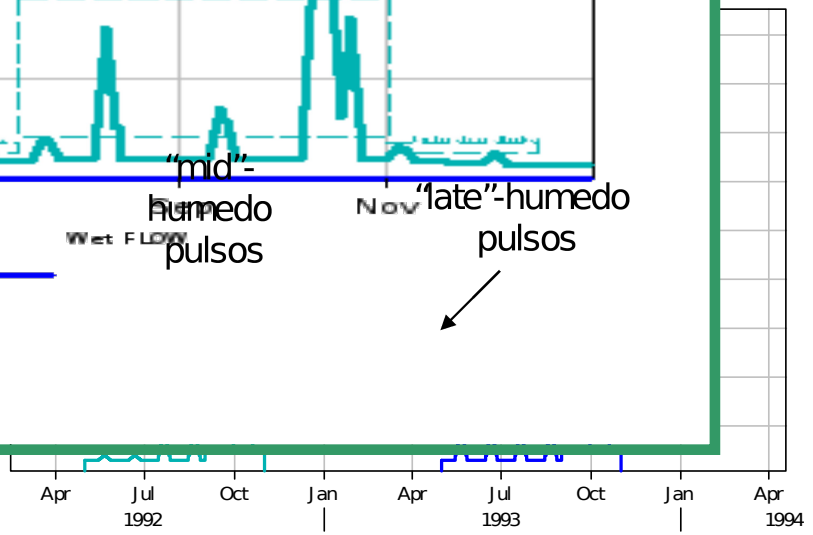
Breakout groups recommended hydrographs, Patuca River, Honduras

Unify Perspectives from Different Stakeholders

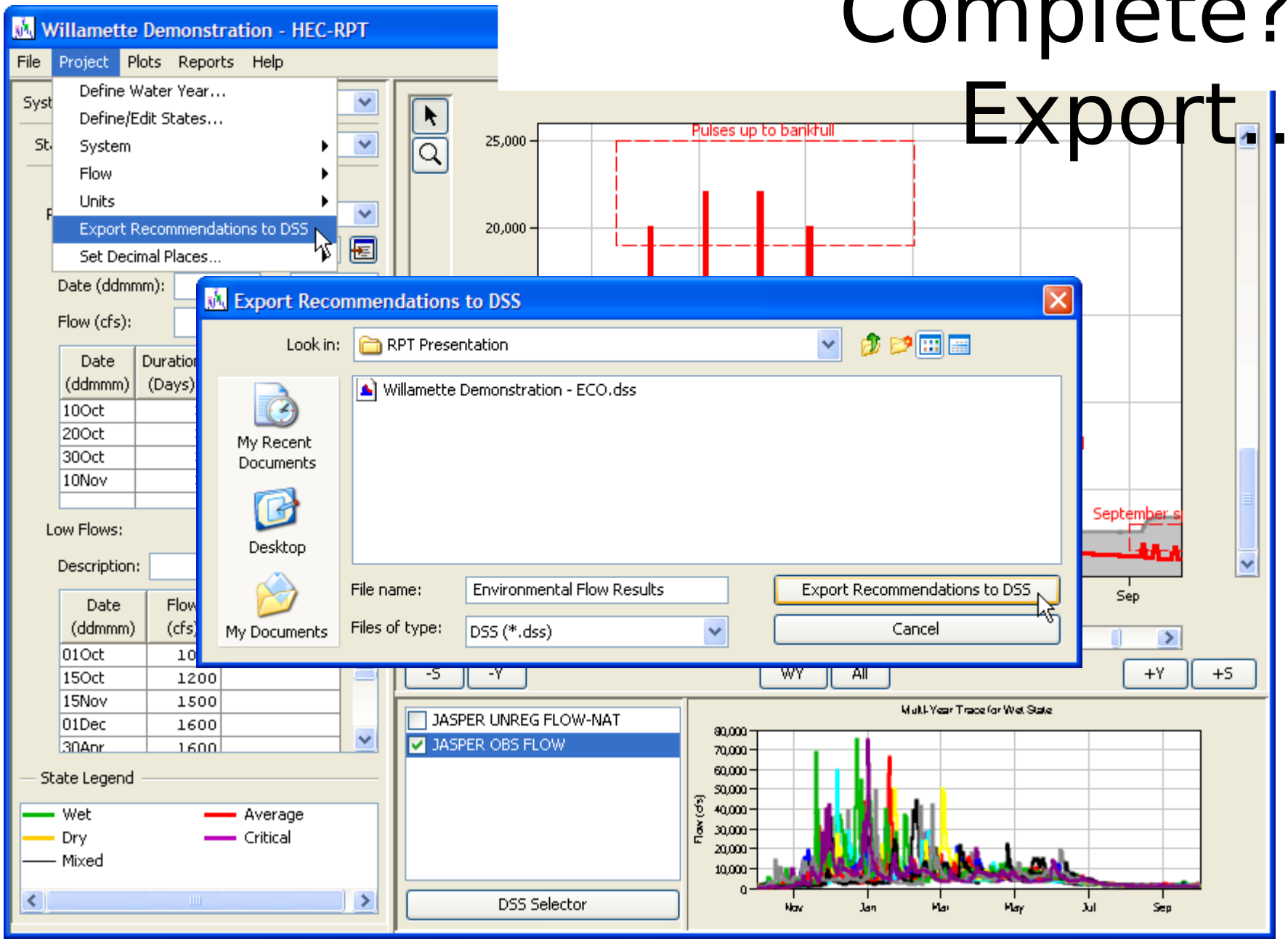
Recommended "unified" hydrograph

Patuca River, Honduras

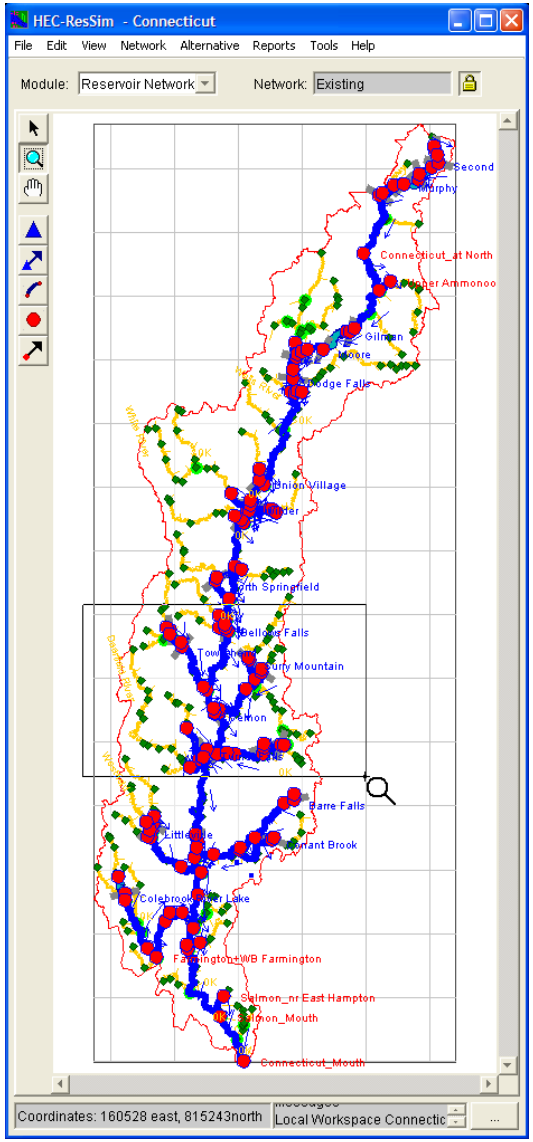




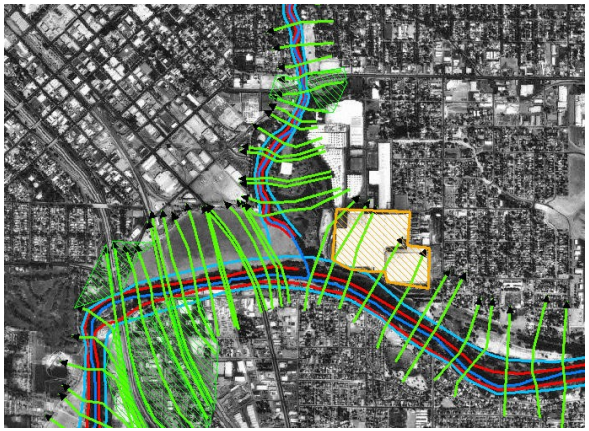
Complete? Export…

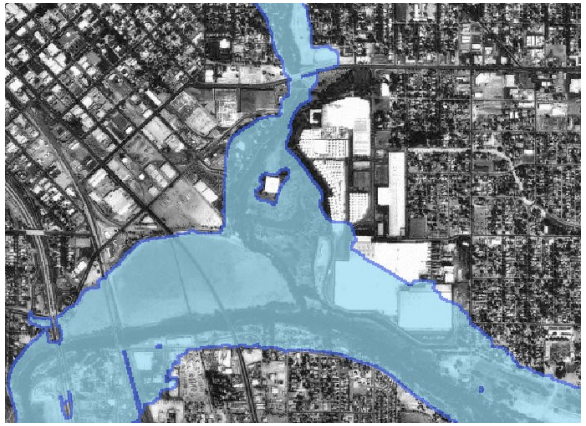


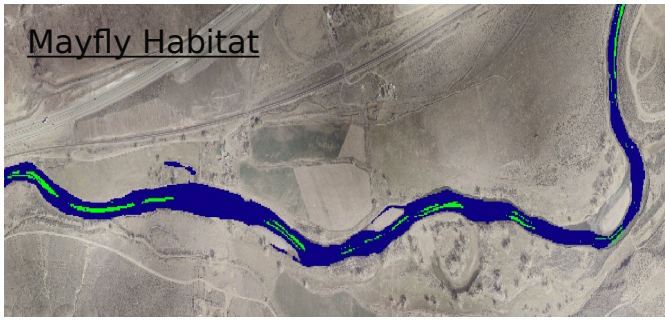
...for analyses with other Software



HEC-RAS	River Hydraulics
HEC-HMS	Surface Water Hydrology
HEC-ResSim	Reservoir Operations
HEC-DSSVue	Data Management and Use
HEC-EFM	Ecosystem Functions Model
HEC-PRM	Water Resource Optimization







Ecosystem Functions Model (HEC-EFM)

- Software used by biologists, geomorphologists, engineers, scientists…that analyzes eco-response to changes in the flow regime (e.g., reservoir operations or channel modifications)
- Use hydrologic and hydraulic data to help predict ecological response
- Indicates direction and relative magnitude of change

Input and Data Requirements

Statistical Assessment Only…

"Flow Regimes"
- Daily flow and stage time series

"Relationships"
- Season
- Duration
- Rate of Change
- Frequency

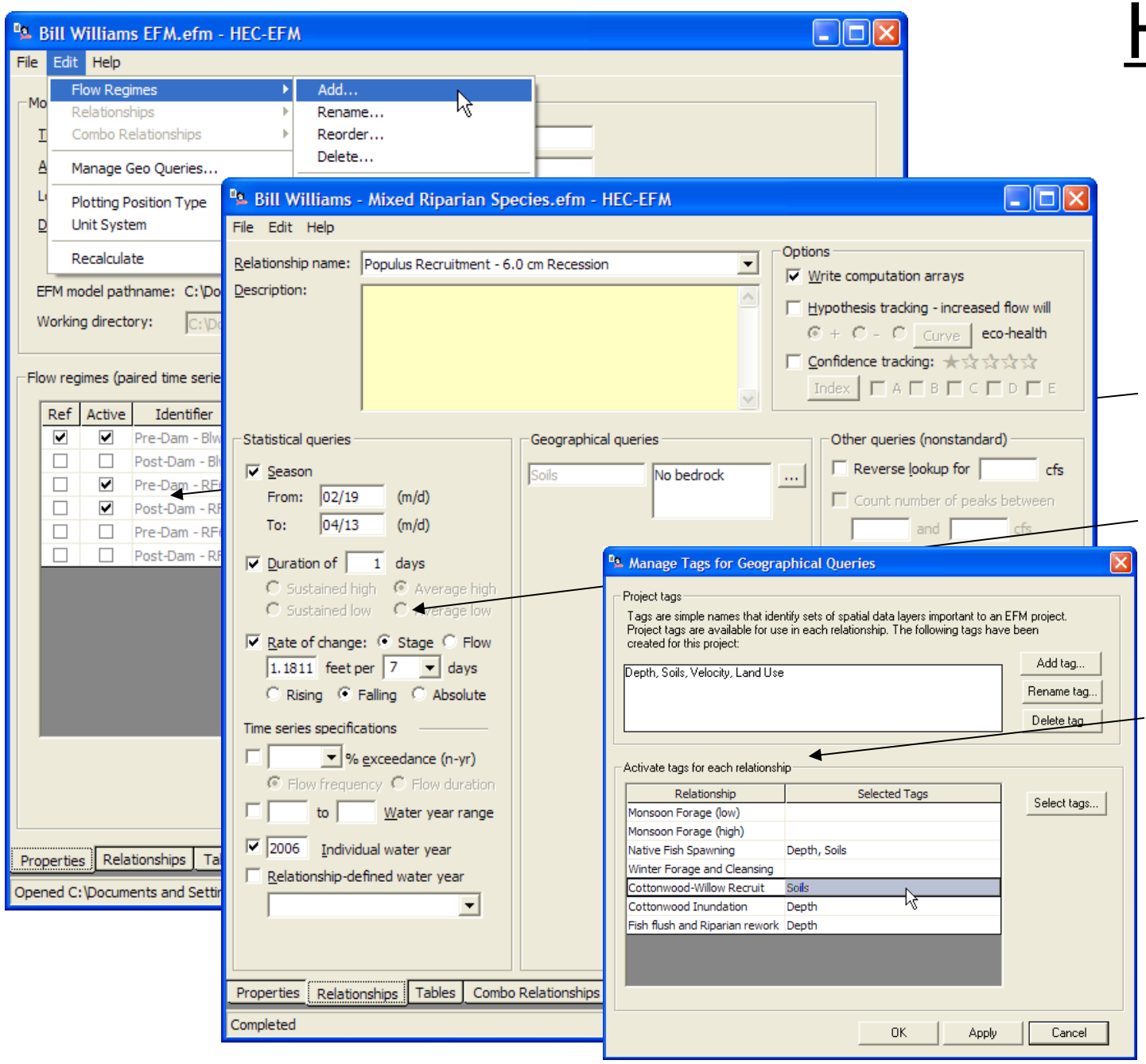
Typically based on the Life Stage histories of species or species groups of interest

…and for Spatial Features

Topographic Data (DTM)
Geo-referenced Hydraulic Model
GIS Software and Data

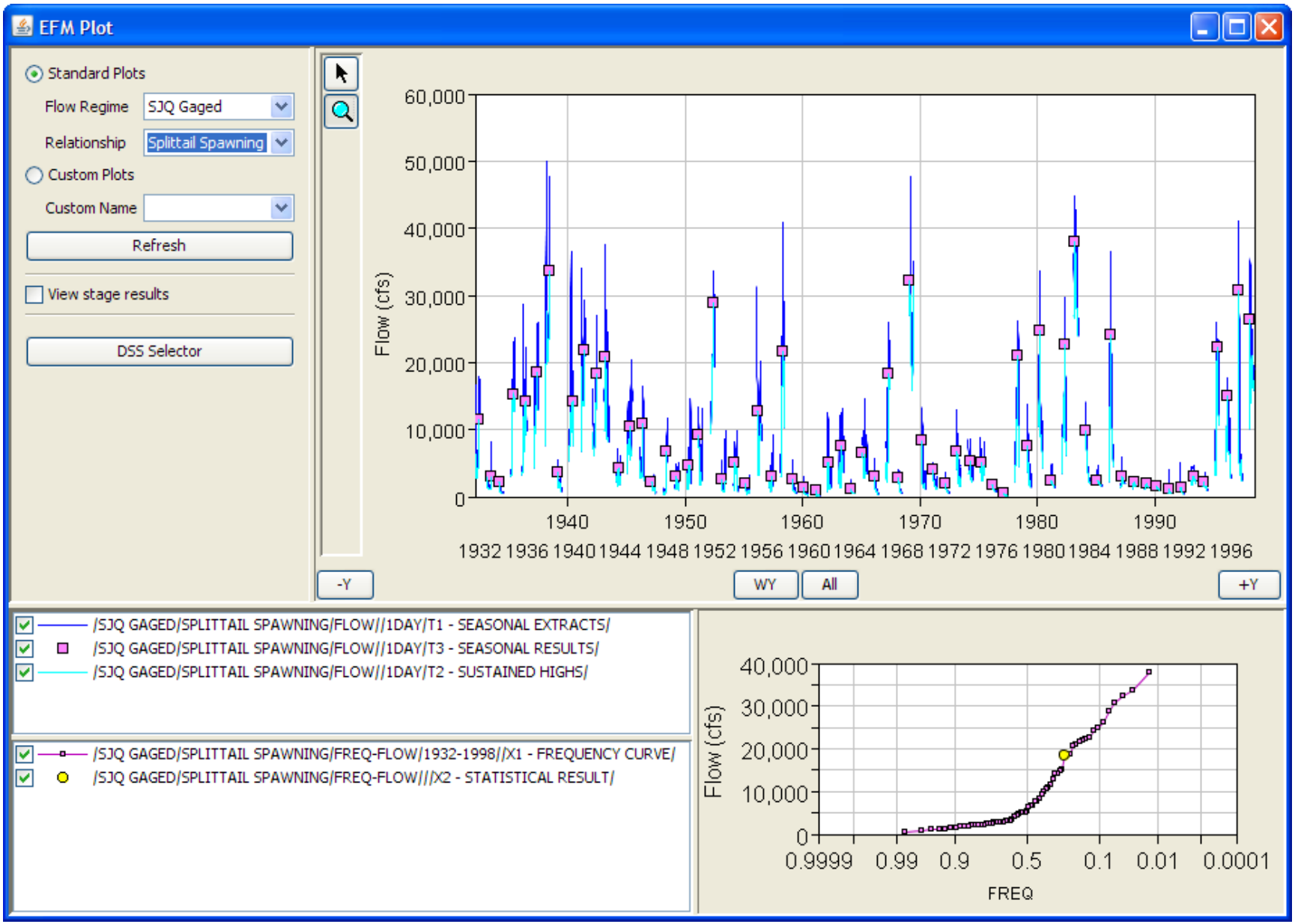
HEC-EFM

Model Interface

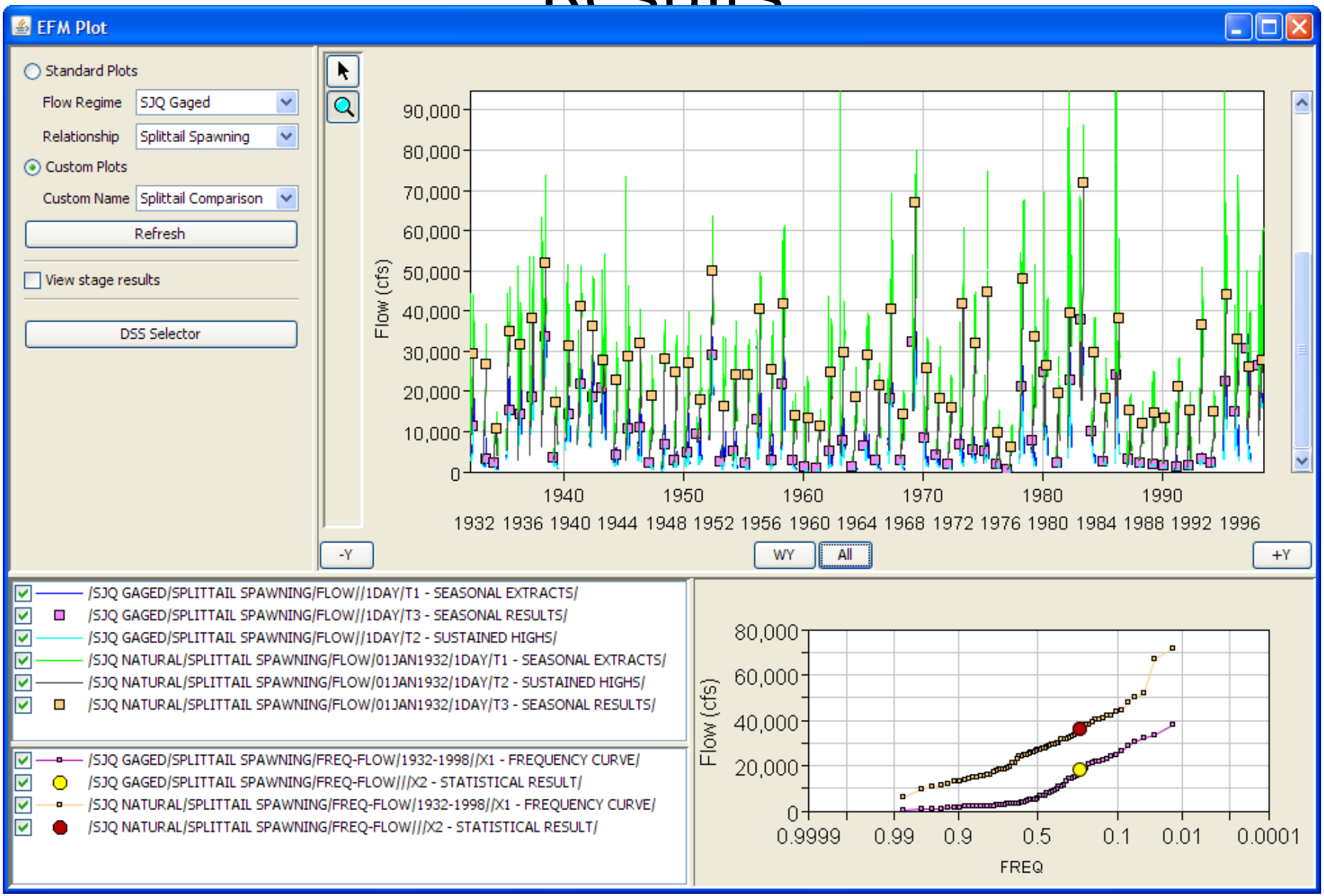


- Analyze up to ~37,000 flow regimes at once
- User-defined stats link hydro and ecology
- Geo queries add spatial aspects to relationships
- *Test alternatives: channel shapes, water use/mngt*

EFM Plotter - Viewing EFM Output

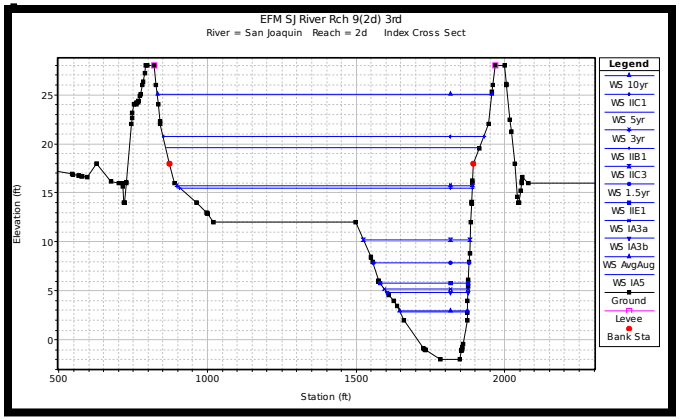


EFM Plotter – Comparing Statistical Results

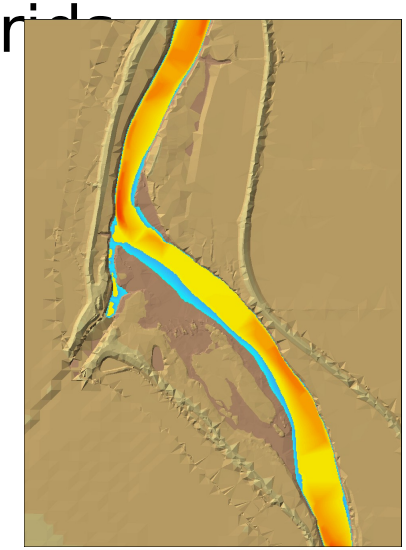


EFM - Going Spatial...

- Statistical results (flows) are input to a hydraulic model (HEC-RAS) to develop
  - Water surface profiles
  - Shear stress

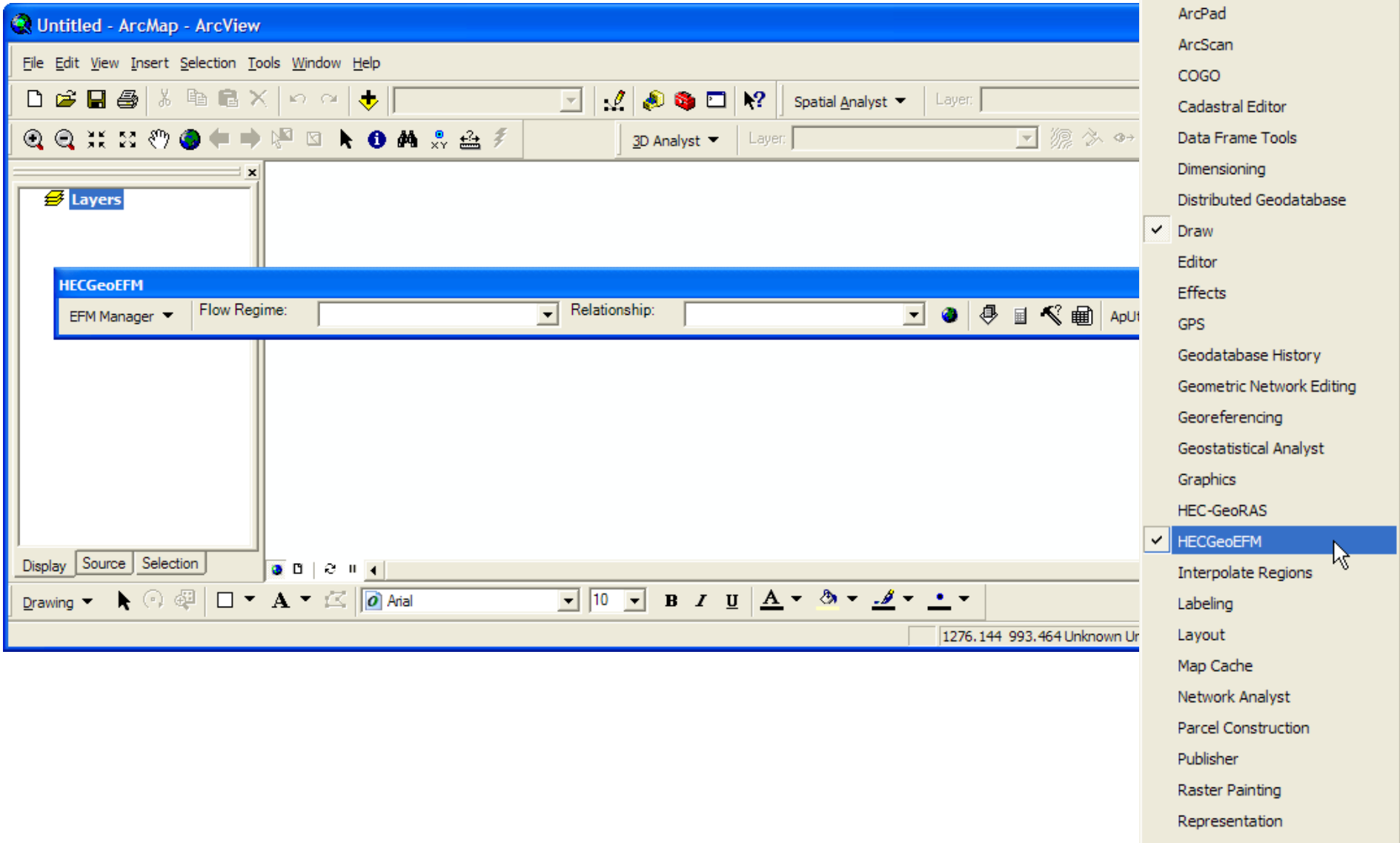


- GeoRAS distributes RAS output into grids for GIS analysis and display
  - Depth grid
  - Velocity grid
  - Inundation boundary maps



GeoEFM – Partnering HEC-ESRI

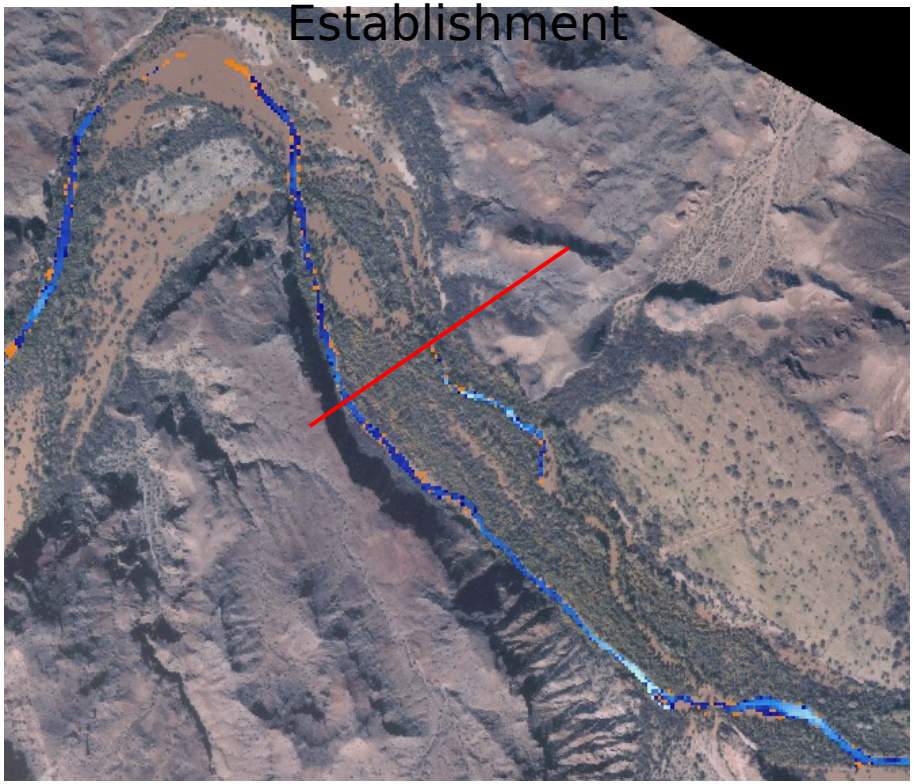
Toolbar for Arc 9.2+



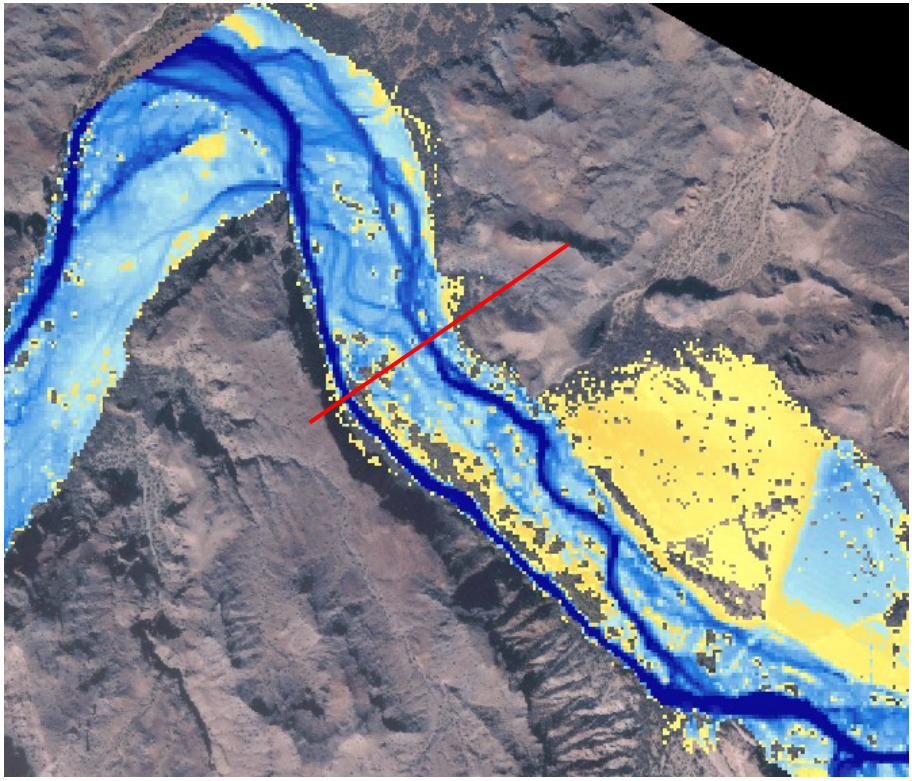
GeoEFM – Data view controls

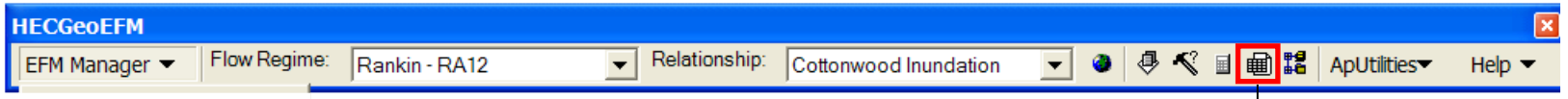
…toggle between eco-aspect or water mngt scenarios

Rankin – Cottonwood Establishment



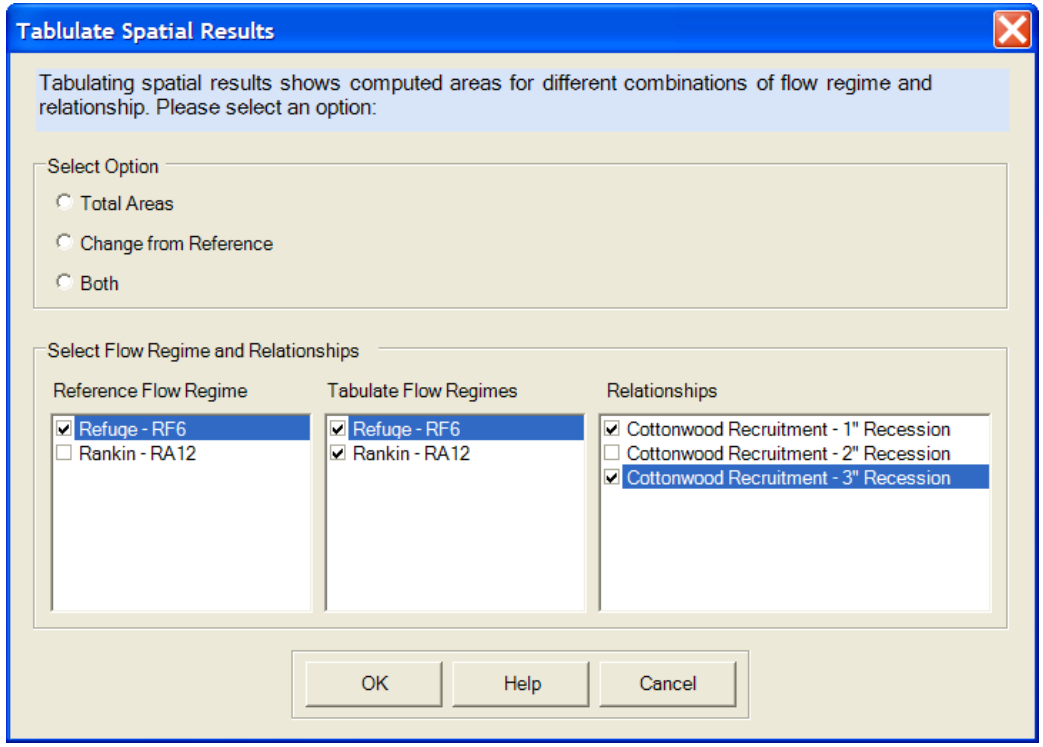
Rankin – Riparian Rework





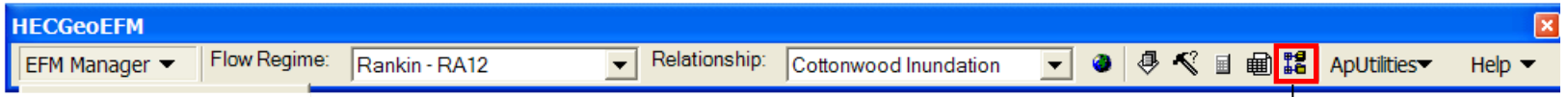
Tabulate Spatial Results

...look at changes in area



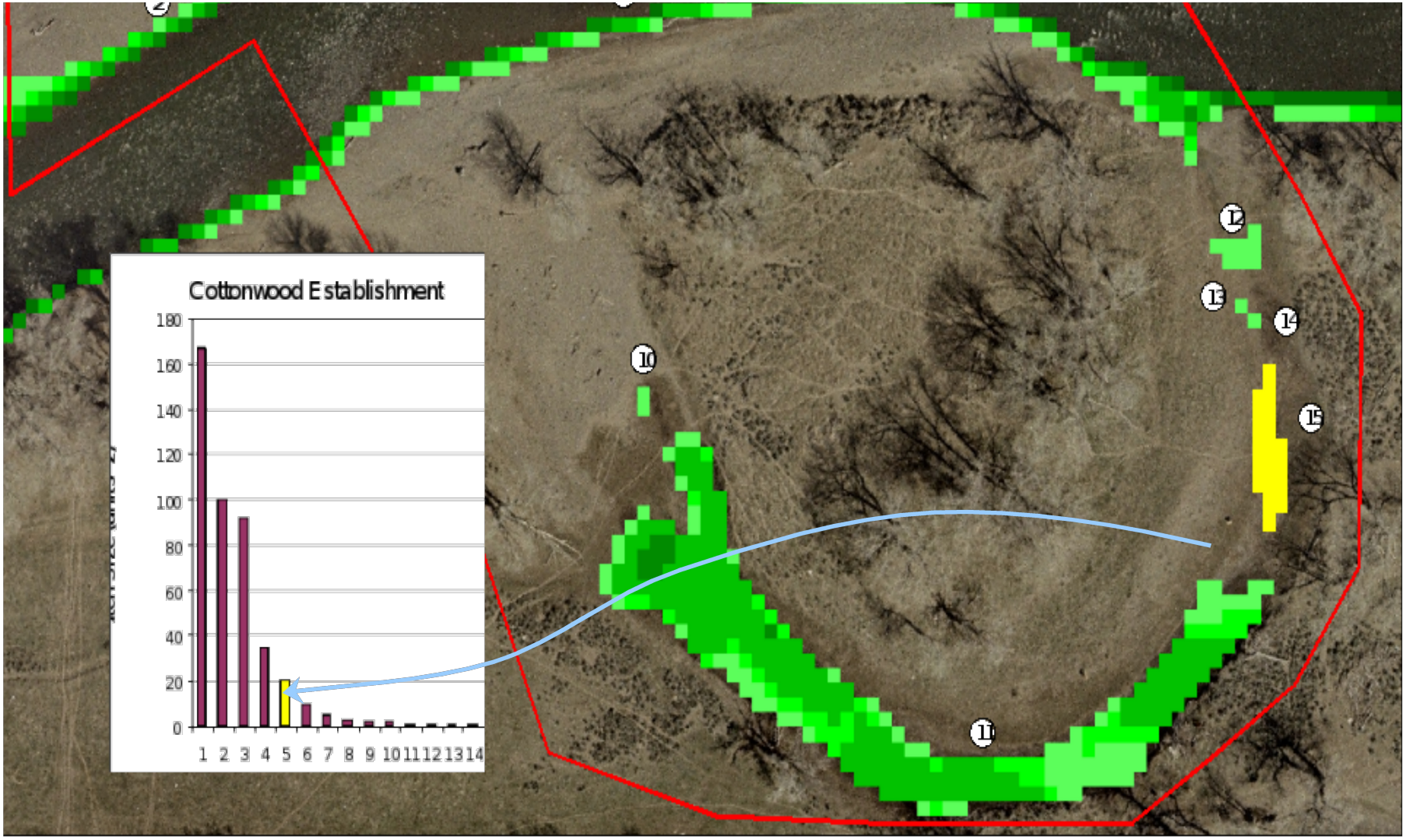
Summary

		Refuge - RF6	Rankin - RA12	
Relationship	**Conf.**	Area (acres)	Area (acres)	Change (acres)
Cottonwood Recruitment - 1" Recession	n/a	###.#	###.#	###.#
Cottonwood Recruitment - 2" Recession	n/a	###.#	###.#	###.#
Cottonwood Recruitment - 3" Recession	n/a	###.#	###.#	###.#
Cottonwood Inundation	n/a	###.#	###.#	###.#



“Patch” Tool

...look at changes in connectivity



Bill Williams River: Mixed Riparian Species

Bill Williams - Mixed Riparian Species.efm - HEC-EFM

File Edit Plot Help

Evaluated at: 04/12/2008 16:39

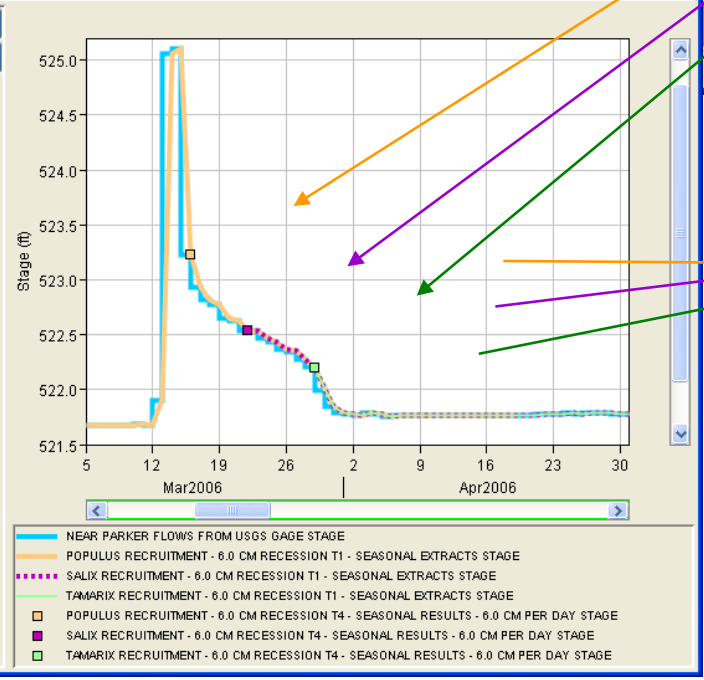
Summary

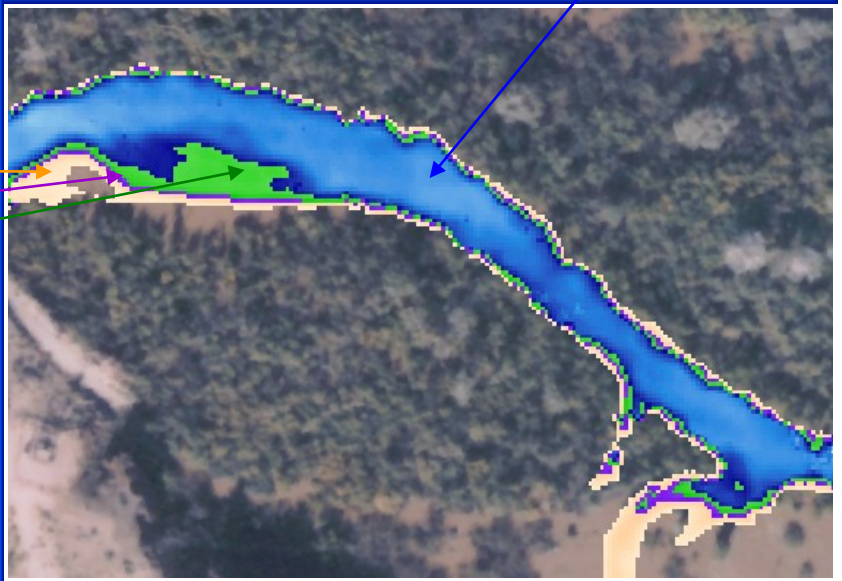
		at BWR Refuge - RF6	
Relationship	**Conf.**	**Stage, ft**	**Flow, cfs**
Populus Recruitment - 6.0 cm Recession	n/a	523.2	341
Salix Recruitment - 6.0 cm Recession	n/a	522.5	155
Tamarix Recruitment - 6.0 cm Recession	n/a	522.2	90
Mean flow post-release - April 2006	n/a	521.8	37

Recalc

/BILL WILLIAMS RIVER/NEAR PARKER/STAGE/01JAN2006/1DAY/FLOWS FROM U...

File Edit View


525.0
524.5
524.0
523.5
523.0
522.5
522.0
521.5
Stage (ft)
5
12
19
26
2
9
16
23
30
Mar2006
Apr2006
NEAR PARKER FLOWS FROM USGS GAGE STAGE
POPULUS RECRUITMENT - 6.0 CM RECESSION T1 - SEASONAL EXTRACTS STAGE
SALIX RECRUITMENT - 6.0 CM RECESSION T1 - SEASONAL EXTRACTS STAGE
TAMARIX RECRUITMENT - 6.0 CM RECESSION T1 - SEASONAL EXTRACTS STAGE
POPULUS RECRUITMENT - 6.0 CM RECESSION T4 - SEASONAL RESULTS - 6.0 CM PER DAY STAGE
SALIX RECRUITMENT - 6.0 CM RECESSION T4 - SEASONAL RESULTS - 6.0 CM PER DAY STAGE
TAMARIX RECRUITMENT - 6.0 CM RECESSION T4 - SEASONAL RESULTS - 6.0 CM PER DAY STAGE



Conclusions

- HEC-RPT on web since Oct 2006
- 1900+ downloads in first year
- Next application: Yangtze River, China?
- First joint software development with Nature Conservancy

- HEC-EFM beta review completed March 2008
- Version 1.0 web release imminent
- Plotter and GeoEFM development continues…